together in such a way as to render taking down and removal a comparatively easy matter. In addition to the circular inclosure supporting the dome, the height of which is about 20 feet, the dome itself being 40 feet diameter, there are two or three rooms and an entrance porch, available as a dark room and computing room. The mechanism for moving the dome and the dome itself are in good order, but in the opinion of the Committee, it would be advisable to go to some expense in providing brackets for the wheels on which the dome runs with horizontal rollers as guides instead of the flanges on the wheels. The observing platform is a first-rate one and will need no alteration. It is suitable for general observational work, or for work where the use of a large spectroscope renders considerable space necessary in any direction.

The shutters of the dome will require some slight repair.

As regards the apparatus with this telescope there are the usual battery of eye-pieces suitable to the telescope; a series of parallel bar, ring, and other fixed micrometers, a very fine parallel wire micrometer, all complete in mahogany boxes; a fine barrel chronograph in glass case, and a good sidereal clock with compensated pendulum. These with sundry apparatus belonging to the telescope complete the outfit.

We had no opportunity of thoroughly testing the clockwork. We consider that it might be advisable to add an electric control and slow-motion gear of the modern pattern in order to render the telescope more efficient in this respect.

II. We have drawn up a specification showing more fully the work required to be done in order to put the telescope simply into an efficient state, but we would recommend that the opportunity be taken to add electric lighting to the circles and micrometer, to provide an electric control to the clock and an electric slow-motion gear. We would further recommend that 12 cast-iron brackets be added to the dome as supports for the wheels, that one or both of the flanges be turned off these wheels, and that horizontal rollers carried by the brackets be added as guides to keep the wheels on the rail. This, we think, would render the turning of the dome much more easy. We would retain the iron circular wall under the dome in preference to a brick or stone wall, as offering more favourable conditions for the telescope. We have added in the appendix our estimate of the cost of this work.

III. When erected and in working order, this telescope will be specially adapted to any work in observational astronomy for which a large aperture is required, and if it is decided to restrict the use of the telescope to micrometric measures of faint satellites, or to the scrutiny of planetary details, no outlay will be required for additional apparatus, beyond an efficient system of lighting the circles and micrometer with small electric lamps. Should it be determined, however, to undertake work in stellar physics, which we understand, from the letter published in NATURE, is the wish of the donor, and which we would strongly recommend as the most useful systematic work to take up, then the necessary spectroscopic outfit, at present wanting, would have to be provided. We estimate the cost of this at about £100. So equipped the telescope would at once be capable of commencing systematic work of first-class importance that would amply repay the cost of keeping such an instrument regularly employed, and in carrying on such systematic work no further outlay in buildings would be required, the computing and dark rooms attached to the dome being sufficient for the work to be done at the telescope. But in our view it would greatly increase the usefulness of this instrument for spectroscopic research if it were placed within easy reach of a physical laboratory where apparatus would be available for experimental investigations in connection with the telescopic observations. As regards the selection of a site we consider it a matter of great importance that the instrument should be located where it would be easy of access to members of the University engaged in making observations with it. It is essential for the effective use of an instrument in a variable climate that the observer should be as near his work as practicable.

W. H. M. CHRISTIE.
A. AINSLIE COMMON.
April 3, 1889. A. GRAHAM.

The previous experience of these gentlemen has also enabled them to give an approximate estimate of the expense of the removal and re-erection of the telescope at Cambridge. It appears unnecessary to quote the details of their estimate, but the total sum is given by them as £770.

At the time when Mr. Newall had in contemplation his offer to the University, he was already very ill, and the Syndicate heard with deep regret of his death on the 21st of April. They have reason to believe that he was gratified, before his death, with the prospect that his valuable instrument would probably contribute to the advancement of astronomical science at Cambridge.

Since his death, the executors, with the full approval of his family, have renewed the offer to the University. The Syndicate are of opinion that the University should avail itself of the opportunity of possessing this fine instrument, and they are at present occupied with schemes for its proper maintenance and use.

C. E. SEARLE, *Vice-Chancellor.*
E. J. ROUTH.
J. W. L. GLAISHER.
J. C. ADAMS.
G. D. LIVEING.
G. H. DARWIN.
May 18, 1889. J. J. THOMSON.

SOME PROPERTIES OF THE NUMBER 7.

1. MY attention was recently drawn by a pupil to the following property, which will be best illustrated by working out a particular example:

$$\begin{array}{rr@{\,}lrl}
\text{Let } N = & 342544 & 3 & & \\
u_2 = & 34253 & 8 & \textit{i.e.}\ u_2 = & 342544 - 2 \times 3 \\
u_3 = & 3423 & 7 & u_3 = & 34253 - 2 \times 8 \\
u_4 = & 340 & 9 & u_4 = & 3423 - 2 \times 7 \\
 & 32 & 2 & & \text{and so on:} \\
 & 2 & 8 & &
\end{array}$$

if any one of the quantities u_2, u_3, u_4, &c., is divisible by 7, then N is so divisible.[1]

$$\begin{aligned}
\text{For, let } N &= 10P_1 + p_0 \\
u_2 &= 10P_2 + q_1 \\
u_3 &= 10P_3 + q_2 \\
u_4 &= 10P_4 + q_3 \\
u_{n-1} &= 10P_{n-1} + q_{n-2} \\
u_n &= 10P_n + q_{n-1} \qquad = 7Q, \text{ by hypothesis.} \\
\text{Now, } 10P_1 &= 10^2P_2 + 10(q_1 + 2p_0) \\
10^2P_2 &= 10^3P_3 + 10^2(q_2 + 2q_1) \\
10^3P_3 &= 10^4P_4 + 10^3(q_3 + 2q_2) \\
10^{n-1}P_{n-1} &= 10^nP_n + 10^{n-1}(q_{n-1} + 2q_{n-2}); \\
\therefore N = 10P_1 + p_0 &= 21[p_0 + 10q_1 + \ldots + 10^{n-2}q_{n-2}] \\
&\qquad + 10^{n-1}(10P_n + q_{n-1}) \\
&= 21M + 10^{n-1}(7Q) = 7Q^1.
\end{aligned}$$

Or we may proceed thus:—

$u_2 = P_1 - 2p_0$; $\therefore N = 10(u_2 + 2p_0) + p_0 = 10u_2 + 21p_0$; hence, if N is divisible by 7, so also is u_2, and so on.

If for 2 we substitute 1, 3, 4, 5, . . . n, then if N is divisible by 11, 31, 41, 51(3, 17), . . . $10n + 1$, so also are (the corresponding) u_2, u_3, . . . u_n.

In like manner, if we strike off 2, 3, . . . n figures, then if N is divisible by (101, 201, . . . $10^2n + 1$), (1001, 2001, . . . $10^3n + 1$), . . . and so on, so are u_2, u_3, . . . u_n.

2. This property was suggested by the question, "Prove that a number consisting of six like figures (111111) is divisible by 7."

Let x be the digit, and let it be repeated n times, then if N be of the form $(7p - nx)10^n + (10^{n-1} + 10^{n-2} + \ldots + 10 + 1)x$, *i.e.* such a number as 5733, in which we have $57 + 2 \times 3$ = multiple of 7, it will be divisible by 7, if $-n \cdot 10^n + (10^n - 1)/9$ is, *i.e.* if $(9n - 1)10^n + 1$ is, *i.e.* if $(2n - 1)10^n + 1$ is, *i.e.* if $(k =)\ (2n - 1)\ 3^n + 1$ is.

Omitting the case of six like digits, we write down the following table for an inferior number, the use of which is explained subsequently.

(1)		(2)		(3)		(4)		(5)	
$7p+2 \ldots 2$	1	$7p+5 \ldots 5$	11	$7p+6 \ldots$	111	$7p+4 \ldots$	1111	$7p+1 \ldots$	11111
$7p+4 \ldots 4$	2	$7p+3 \ldots 3$	22	$7p+5 \ldots$	222	$7p+1 \ldots$	2222	$7p+2 \ldots$	22222
$7p+6 \ldots 6$	3	$7p+1 \ldots 1$	33	$7p+4 \ldots$	333	$7p+5 \ldots$	3333	$7p+3 \ldots$	33333
$7p+1 \ldots 1$	4	$7p+6 \ldots 6$	44	$7p+3 \ldots$	444	$7p+2 \ldots$	4444	$7p+4 \ldots$	44444
$7p+3 \ldots 3$	5	$7p+4 \ldots 4$	55	$7p+2 \ldots$	555	$7p+6 \ldots$	5555	$7p+5 \ldots$	55555
$7p+5 \ldots 5$	6	$7p+2 \ldots 2$	66	$7p+1 \ldots$	666	$7p+3 \ldots$	6666	$7p+6 \ldots$	6666

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[1] In fact, 21 may be substituted for 7.

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That is, third line of (3) say, 67333, 781333, &c. (note $67 = 7 \times 9 + 4$, $781 = 7 \times 111 + 4$), are multiples of 7. We may preface any one of the above series of numbers with, or affix to them, sextets of digits, like or unlike to those of the number we select. I confine my attention to sextets of like figures affixed, as in this way I am able to find what values of n make k a multiple of 7.

The series in (1) is, of course, $n = 1, 7, 13, 19$, and so on: and so for the other sets. The values of n to be taken are:—

for (1), $n = 19, 61, 103, 145, \ldots$

(*i.e.* if we write down 19 3's, we must preface these with a number of the form $7p + 6$.)

(2), $n = 2, 44, 86, 128, \ldots$
(3), $n = 15, 57, 99, 141, \ldots$
(4), $n = 10, 52, 94, 136, \ldots$
(5), $n = 41, 83, 125, 167, \ldots$

University College School. R. TUCKER.

THE BHILS AND THEIR COUNTRY.

IN the current number of the *Asiatic Quarterly Review*, Sir Lepel Griffin has a long and most interesting article on the Bhils, an aboriginal tribe of Central India living in the jungle and rough country around the Vindhya Mountains. Sir Lepel says that for eight years he presided over the province which includes the Bhil country, and he had ample opportunity in that time of studying the habits and language of this interesting people. The people themselves claim that they represent the aboriginal races of India who were forced to retire before the Aryan conquerors. Through their country flows the sacred Nerbudda River with all its Hindu shrines. The Bhils, however, seem to care very little for the Hindu deities; they have been forced by the Hindus, who treat them with profound scorn and contempt, to give a sort of half-hearted acceptance of the chief Hindu deities, but in fact they never worship the gods of their superiors. In one respect, however, they agree with the Hindus, and that is in regarding the Nerbudda with feelings of terror and veneration. From the earliest days of the Aryan conquest of India, the Bhils have been looked on as wild animals, deserving of no protection or kindness. In a few States, such as Barwani and Rajpur, they were so numerous, that their conquerors found it more profitable to tolerate them, keeping them, however, at the same time, in the most abject poverty and subjection. Since the advent of the British Government, the condition of these simple and harmless people has much improved, so that the poor Bhils are gradually becoming less and less savage. Their knowledge of woodcraft and of the habits of birds and beasts makes them invaluable to English officers. Unlike the orthodox Hindu, the Bhil has always eaten the flesh of the cow and the buffalo and other abhorred animals. In fact, he eats every wild animal except the monkey, which is universally worshipped in the form of the forest god Hanumán. The tiger is held in great respect, and the people are very unwilling to kill it, unless it is a man-eater. If a beast has thus become obnoxious, a trial is held with religious rites, and if the animal is found guilty, sentence is passed upon him, he is pursued, killed, and hung up on a tree over the main road as a warning to all evil-doers of his species. It is very curious, and shows the antiquity of this race, that at the coronation of the highest Rajput chiefs, in States where the Bhils live, the sacred mark of kingship is impressed on the forehead of the new chief by the head of the Bhil family to which this hereditary privilege belongs, and the Bhils do not regard him as their king till this ceremony is performed. The Bhils are noted for their endurance, for their capacity of living where others would starve, their indifference to the greatest changes of temperature. Not even to save his life will a Bhil tell a falsehood. Their most solemn oath is by the dog, their most valuable companion in the chase. They are gay and of a light-hearted disposition, and take every opportunity of having a feast and a drinking-bout. Their drink is made from the Mowra, a tree which abounds in Central India, the white flowers of which, when pounded and mixed with grain, form a palatable food, and when distilled by a simple process produce a highly intoxicating spirit. Their priests are not of any particular caste, but the office is an hereditary one. The deities most generally worshipped are the ordinary Vedic deities of water, fire, and the heavens, and each village has its presiding deity, who is a different personage in each village. Like Hindus they burn their dead, except unmarried children of both sexes, who are buried, as also those who die from small-pox. In case of cholera they also bury the dead, believing that the smoke from the pyre disseminates the disease. The dead are worshipped and propitiated by offerings; tree worship is unusual; witchcraft and omens are implicitly believed in; charms of various kinds are universally used.

SCIENTIFIC SERIALS.

THE *Quarterly Journal of Microscopical Science* for April 1889 contains the following:—Contributions to the knowledge of *Amphioxus lanceolatus*, Yarrell, by Prof. E. Ray Lankester, F.R.S. (plates xxxiv.–xxxvi.*b*). Referring to his notes on the anatomy of Amphioxus published in 1875, the author withdraws his confirmation of Johann Müller's statement that there is a pair of apertures on either side of the oral sphincter (velum of Huxley). In reality there are no such apertures at all. Those important structures, described as the "brown funnels," are fully described and excellently illustrated; some few numerical data of importance for the anatomical discussion of Amphioxus are given; some errors which appear to be current as to the existence or non-existence of spaces of one kind or another in the body and gill bars are corrected; and some drawings are given, which represent in a semi-diagrammatic form the structure of Amphioxus, not merely as seen in sections or dissections, with all their obvious drawbacks, but as reconstructed and corrected from the examination of numerous specimens, so that they present as nearly as might be a true conception of the living organism. This excellent paper will be welcomed by all students.—Studies in the embryology of the Echinoderms, by H. Bury (plates xxxvii.–xxxix.). In this memoir the author confines his attention;—to the primary divisions of the cœlom, starting from a stage in which at least two enterocœle pouches are already present;—the hydrocœle; its development and connections;—and to the skeleton, so far as it is developed in the dipleurula stage.—On the ancestral development of the respiratory organs in the Decapodous Crustacea, by Florence Buchanan (plate xl.).

The *Journal* for May 1889 is a special issue, and contains a memoir on the maturation of the ovum in the Cape and New Zealand species of Peripatus, by Lilian Sheldon, Bathurst Student, Newnham (plates i.–iii.). The ovarian structures are fully described in *Peripatus capensis*, *P. balfouri*, and *P. novæ-zealandiæ*. A summary of events in the maturation and fertilization of the ovum in these three species is also given; these are followed by some details of the origin of the ova from the germinal epithelium; the disappearance of the germinal vesicle; the formation of the polar bodies, and the formation of the yolk. Among the many interesting facts mentioned are those in reference to the polar bodies: in *P. novæ-zealandiæ* they appear to be completely absent, but two very prominent bodies are present in the Cape species; they are also in these species exactly similar to one another—a series of facts at variance with Weismann's theories.—With this number is given a series of very valuable indexes: an index to the *Journal* from 1853 to 1888; and one to the Transactions of the Microscopical Society from 1853 to 1868; also to the Proceedings of the Dublin Microscopical Club from 1865 to 1880. These indexes are paged separately, so that they may be bound up as an independent volume.

Engler's Jahrbücher, vol. x., includes the following articles:—The first part of the description of the plants collected by Dr. Marloth in South Africa in 1885–86 (with six plates). The descriptions are prepared by Dr. Engler, with the help of other botanists, and include the Monocotyledons, and Archichlamydeous (Choripetalous and Apetalous) Dicotyledons.—On the anatomical characters of the *Monimiaceæ*, by M. Hobein. This natural order is one as to the position of which various opinions have held; the author's observations strengthen the alliance to Laurineæ, inasmuch as in both orders secretory cells are constantly present.—A monographic review of the species of the genus Primula, by Dr. F. Pax. An attempt to trace the phylogenetic relationships of the species of this large genus.—The second part of the description of Dr. Marloth's plants from

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